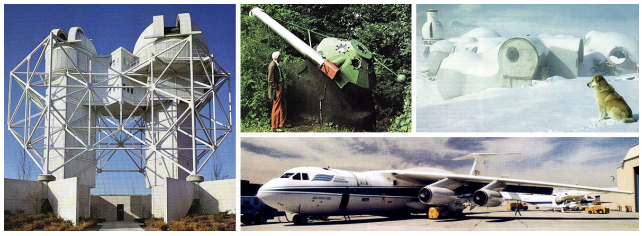
BAA

I & I News

New Series No. 19 | Newsletter of the Instruments and Imaging Section | 16 June 2014

My recent request for examples of designs of observatories resulted in numerous contributions describing and illustrating many and various types, from small low-cost designs to large structures housing several instruments. I thank all contributors for their response and enthusiasm, presenting an opportunity to disseminate many ideas to suit individual requirements. Since issuing *Technical Tips* No. 12 (20 May), which includes photographs of forty-three of these observatories, I have received several more contributions and related articles. Seventeen of the observatory articles are presented here, and others will follow in subsequent issues of *I&I News*.

In the meantime, here are a few more ideas ...



Bob Marriott, *Director*

An observatory in Bedfordshire

Gordon Ewen

Two years ago I moved house and decided to have an observatory built. I wanted to use two mounts: one carrying an Edge 11 SCT and the other carrying a Lunt 152 solar telescope and a Esprit 120 refractor. As I had decided to have two mounts the observatory had to be a roll-off roof type rather than a dome – which was what I preferred, as I like to sit and look at the sky when the cameras are running.

The observatory, measuring 5 x 3 metres, was designed and built by Mike Atkins of Hoddesdon, and was built in August and September 2012. It consists of a timber frame finished with shiplap on the outside and MDF sheet on the inside. The floor is finished with cork tiles stained with black emulsion to produce a darkish finish. The roof sits on four wheels rated to carry 250 kg; which is necessary, as it weighs around 400 kg and is opened and closed by hand winches. The total cost was around £6,000.

The Edge 11 sits on an Avalon Fast Reverse mount, and the two refractors are mounted on an EQ8. I can use the Edge at f/2 (HyperStar) and f/7 (reducer) as well as at its native f/10, with either monochrome or colour cameras.

So far the observatory has worked very well, but it now requires routine maintenance, including more coats of Danish oil.

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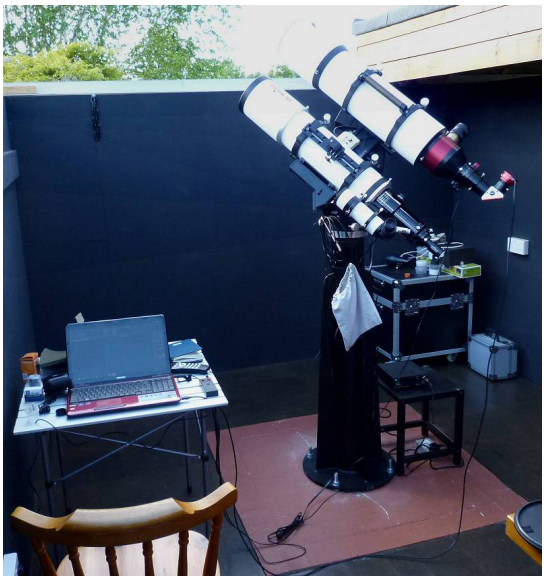

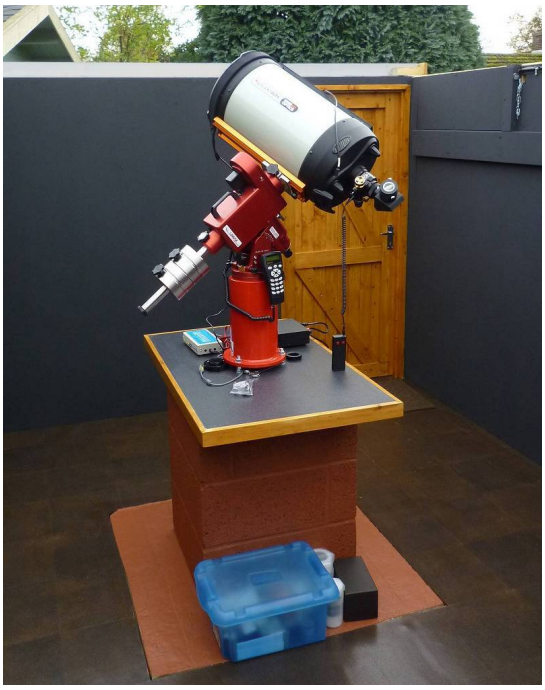

An observatory with a coelostat

John Eland

My observatory consists of a coelostat and a refractor housed in a commercial garden shed. The 10-inch flat mirror is secured on a home-built altazimuth mounting with microdrive stepper motors on the two axes. The mounting and electronics were first built in the 1980s, almost entirely from scrap materials (such as worm gears hobbed from plexiglass), and have moved with me from place to place. The shed cost about £400 in 2003. Telescopes can be mounted interchangeably in V-blocks on parallel timber rails, and metal rails allow fixed mounting of cameras or spectroscope. The photograph shows a 6-inch f/10 doublet OG (Jaegers, USA, $670 in 1983) telescope used particularly for solar projection and for planetary imaging.

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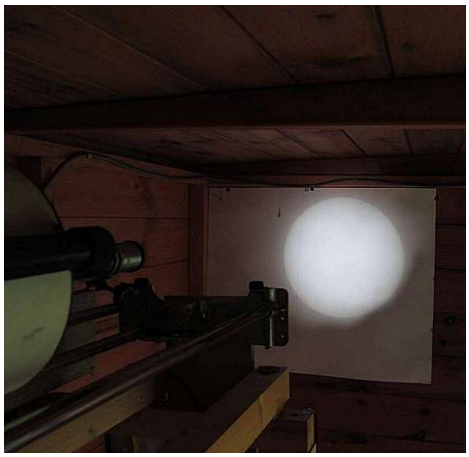

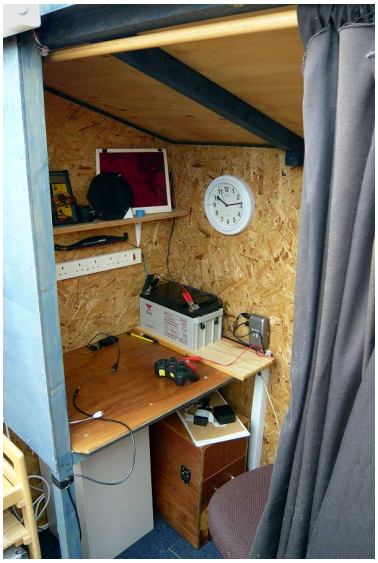

A run-off roof observatory

Phil Jaworek

My observatory was scratch built by myself in 2006, to house my Celestron CGE C11 set-up that I had at the time. It is a roll-off roof design with a 7 x 7-foot telescope bay and a 3½-foot deep lean-to warm room and office area. It still houses the Celestron mount, but I parted with the C11 some years ago and now it mainly houses a Meade 127 EDT for general visual observations and some imaging, though sometimes I use a Skymax 180 Pro for lunar and planetary visual observations and imaging or a Williams Optics FLT 98 for deep-sky imaging. The roof is mounted on six 3-inch wheels (three per side) which run on aluminium plates on external rails fitted to the top of the walls. Two wheels internal of the rails keep the roof in place as it is rolled open or closed. This design is simple and cheap, and if the observatory is covered with snow it just needs a quick brush to clear it. I chose this simple plain rail system due to past experience with more elaborate rails, which froze and became blocked. The roll-off roof is the second incarnation – the original being a hinged arrangement which was very novel and worked well but was limited on windy days The pier was scratch built by myself and was raised by 6 inches, for wall clearance, when I changed from the C11 to the 127 EDT. The total cost of the build in 2006 was around £500, mainly because I used reclaimed timber – which, however, has a tendency to warp, so I shall not use such materials if I ever build another observatory.

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An observatory in the west of Scotland

Iain Cartwright

My 2.2-metre full-height Pulsar observatory was installed in August 2013 in the back garden of my mother's home in Portencross, Ayrshire. The observatory has good views to the north, east, and west, but the southern view is interrupted by the bungalow and trees. The area in which it is installed was overgrown, and I cleared it in preparation for the concrete base. However, due to deep vein thrombosis in my left leg I had to have someone else lay the concrete, and Pulsar Observatories installed the structure. I have a Skywatcher 200PDS 8-inch Newtonian on a Skywatcher HEQ5 Pro mount, mounted on an Astro Engineering pier, and have recently installed an ST-80 guidescope/secondary telescope on the 200PDS. The mount is powered by a 10A mains switch mode 12V power supply, the dome is motor controlled, and I have two Skywatcher power tanks in case of a power cut. The cost, including the concrete and sundries, but not including the cost of the instruments, was around £6,000. It was a serious investment, but I am pleased with it and use it a lot, mostly for imaging. Many of my results are posted at http://www.flickr.com/photos/ic-photo/.

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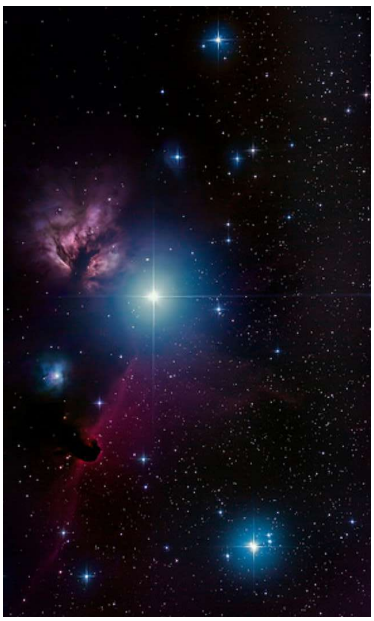

A demobbed veteran

Clive Nanson

This observatory was constructed in 1985 at a cost of around £300. Unfortunately, sky coverage at the site is now severely restricted, due to the growth of trees (including a 25-metre tall poplar a few metres to the south) in the surrounding gardens and fields, and last summer I decided to demolish it. However, it had withstood the British weather for twenty-eight years and was still in full working order, albeit the roof was in need of refelting and the exterior wood required a recoat of preserver. It was a 3-metre octagonal wooden structure, utilising four 125-mm nylon wheels to allow it to rotate on a concrete base, and housing a home-built 250-mm f/6 fork-mounted Newtonian intended primarily for astrophotography. I presented a short talk at a BAA telescope-making day at Hawkstone Hall, London, on 13 December 1986, and one of the accompanying photographs was published with the report of the meeting in the *Journal*.

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An observatory in the Australian bush

Peter Anderson

I have had a lifelong interest in astronomy, and have been a Member of the BAA since 1969. When we were married we lived in suburbia for seven years, but I wanted a better site for astronomy though still close to the city for my work. We found the land – five acres straddling a high bush ridge-top, very near Brisbane – and the house was built during 1974. Then began the planning for the observatory, delayed for several years by having to recover financially from building the house.

After various designs were considered I settled upon a twin-section, roll-off roof, 6.8 x 4.4-metre observatory, built of 20-cm concrete blocks. The primary instrument was a 16-inch f/6 Cave Observatory model with a 10-inch guide-scope and associated equipment – a good instrument for visual work and for prime-focus work of passable quality in the photographic age (tracked with care), but hopeless for CCD tracking. (Instead of circular star images, tiny scratchy squiggles reveal every attempted guide correction.)

Since 1980, when the observatory was completed, my main line of work has been the visual timing of lunar occultations, and, since around 1985, observation of asteroidal occultations. Other 'targets of opportunity' have also arisen. (In the 1980s I was photographically confirming suspect supernovae for the Revd Bob Evans.)

Other instruments now include a 28-cm Celestron CPC, mounted on a wheeled tripod in the observatory, where it can be moved around and serves as a second instrument (and is very good for 'go-to' finding of asteroidal occultation fields).

To the north, trees interfere, and the house is to the south, so the observatory has full-height walls on both those sides. In any event, at 27º.5 south, the south celestial pole lies at a sufficiently reasonable altitude to be accessible. The full-height walls and full-size door also allow conventional and easy access and movement within. On the eastern and western sides the fixed parts of the walls are much lower, and solar-system objects can be followed, full aperture, to the horizon, The 4-inch flanged steel bearing wheels roll within 6-inch steel C beams. The posts to support the rails north and south are 11-inch square concrete block, linked together by a concrete channel below ground to ensure that they stay fixed.

Heavy construction, and lots of overlaps and flashing and so on, have ensured that the observatory is watertight and weatherproof. It is now 34 years old – the only maintenance being painting and lubrication, though in 1996 I installed a ventilation twirly at the north end of the roof, and new paving outside the entrance to replace the log rounds.

In 1978/79 the observatory cost around $7,000 and the instruments cost around $7,000. If I were to build another observatory, however, I would probably not adopt such a design. It has a large amount of space and can accommodate many other items – a couch, cupboards, books, and a tribe of people – but I like the look of the smaller commercial fibreglass domes (such as the Sirius), and a decent, say 14-inch, SCT would easily fit in one and serve my purposes.

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A garden-friendly telescope cover

Geoffrey Johnstone

When I moved to my present house eleven years ago I built a summer house which became the 'observatory.' In it I kept the telescope – a 200-mm Meade LX200 – and the computer on which to download the images acquired. To use the telescope it was necessary to carry it out, place it on a pier and clamp it in place, and then connect the power, the cables, and so on. Over the ensuing couple of years I found this increasingly difficult and tiresome, and was looking for a way of making the whole operation more agreeable without the expense of a second building.

The appearance of the garden is as important to myself (and my wife) as is the need for a nice telescope. So whatever I was to have constructed needed to blend in, and after much thought I produced a design for a dummy dovecote to cover the telescope. After consulting the 'glass fibre' section of Yellow Pages, I contacted a company called Artistic Solutions. The name alone gave some cause for confidence. A telephone call was made, and a drawing was posted to them. The result was that the company agreed to construct the dovecote, and produced an estimate that was half what I was prepared to pay.

When installed, the telescope cover is user-friendly. The power and computer cable are permanently connected, and all that is necessary is to remove the three sections; and for some operations only the two top sections need to be removed. The only thing I did have to build was a step device to enable me to remove the top two sections.

I chose a dummy dovecote, but now wonder what other shapes would enhance the garden if I had the imagination!

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A modified 'Romsey' observatory

Brian Mills

In 2004 I built an observatory to house a 12-inch Meade LX200. However, the wood and felt roof was too heavy and acted as a thermal reservoir that cooled much too slowly, and in 2008 it was replaced with a green fibreglass roof made of flat sheets that I cast myself. Both of these roofs rotated on what was effectively an enormous ball race, with golf balls taking the place of ball bearings. In 2013 I purchased a dome to fit onto the original building to house a 12-inch Ritchey–Chrétien, and added a small annex.

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An observatory in Spain

Paul Downing

Liz and I built our observatory on top of the old farmhouse we bought in the Alpujarra region of Spain. It is built of insulated blocks, rendered with cement and painted. The challenge was to have the pier at the right height and to allow access to the observing area without having to climb long ladders or crawl through tunnels. The compromise was a concrete beam (having to remember to avoid it in the dark) and a step up to a wooden platform to allow access to the telescope and camera. The observatory was built in 2006, and the fibreglass dome was made and shipped here by Pulsar Observatories in the UK.

The installed instrument is a 12.5-inch Planewave Dall–Kirkham fitted with a QSI 683 camera. The camera has a seven-position filter wheel fitted with Astrodon LRGB, HA, S2, and O3 filters, plus an inbuilt off-axis guider for which I use an SBIG STi guide camera. The dome is mounted on rollers, and rather than its being fitted with sidereal motors I turn it by hand.

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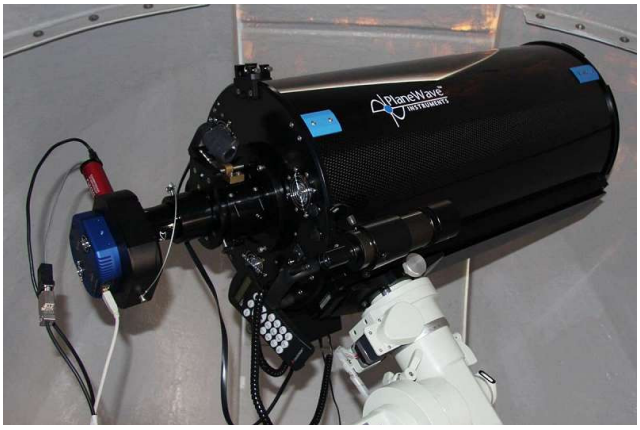
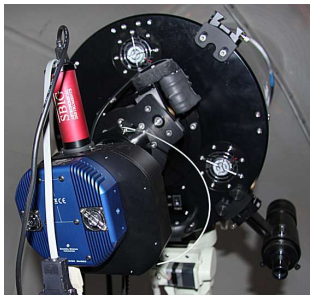
See *I&I News*, New Series No. 1 (26 September 2011), p. 2.





An observatory for variable-star work

Roger Pickard

The telescope is a 14-inch SCT, used for CCD photometry of variable stars. Most of my observing is now carried out remotely, and my compact observatory houses only the telescope and its equipment, including the CCD. After setting up – which involves little more than centring a bright star in the eyepiece – there is no need to access the instrument except to change filters. Housed in an adjacent shed is a PC with two monitors – one displaying the downloaded image and the other an image from Guide 9. This 'control room' PC is networked to another (more modern) PC in my study, from where I control the telescope. I have come to realise that I do not have the time to search for a large number of objects night after night, and instead prefer to concentrate on long time-series of observations of single objects. During the winter this may involve setting up on one object at the start of the night, moving to another by, say, midnight, when I go to bed, and then setting the alarm to wake me to shut down the telescope before dawn – after which I return to bed.

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Roger Pickard is Director of the BAA Variable Star Section
http://www.britastro.org/vss/

Kingstanding Observatory

Gary Poyner

52º 32' 43".98 N, 01º 52' 23".57 W

In the early 1970s my father built me a small observatory to house my 6-inch f/8 Charles Frank telescope. Because of lack of space it was small – 6 x 5 x 5 feet – with a split hinged roof and very small door, and with the roof and walls clad with lightweight corrugated plastic sheets. The observatory lasted me until 1987 (by which time I had replaced the 6-inch telescope with a 10-inch equatorial), when I married and set up home. My first job was, of course, to build a new observatory, much to my new wife's amusement! Because I like gardening, space once again became an issue, so I decided to keep to the same design as the one my father had produced for me. This time I made it as large as possible within the space available – 7 x 6 x 6 feet – and retained the split hinged roof method so that I could have one half closed if the Moon became a problem. The front panel of the observatory can also open to allow views to the south.

I needed it to look like an ordinary garden shed, as crime was on the increase in the area, and anything that appeared out of the ordinary would become an instant target. I clad the outer walls with ship-lap planking but covered the roof with lightweight corrugated plastic sheeting. I also added a full-sized door and mains power. In 1987 the total cost was less than £150, and it is still in good working order. I tend to replace the plastic roof sheets every five or six years, unless they are damaged by cats, squirrels, or fireworks (a spent rocket once entered), and the only other maintenance required is a coat of paint every few years.

During the past twenty-seven years the observatory has housed a variety of telescopes: a 10-inch f/6.5, a 16-inch f/5, and 18-inch f/4.5, a 14-inch Meade SCT, and the current telescope – a 20-inch f/4. It might be thought that a small 'shed' would not accommodate a large telescope, but it can do so easily. The 20-inch is on wheels so that I can move it around the small space, allowing views of all part of the sky. It is a tight squeeze for two people, but I am very much a solitary observer.

The observatory might not be aesthetically pleasing, but I am able to use a quite large telescope within minutes of opening it. As a visual observer I like to be under an open sky, and the observatory provides me with a certain amount of protection from the elements.

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http://www.garypoyner.pwp.blueyonder.co.uk/varstars.html

A POD in Reading

Robert Adamson

In 2011 I installed a Skyshed POD. The total cost, including groundwork, pier, and POD, was approximately £3,000. It houses a Williams FLT 123 (123-mm refractor) and a 70-mm guidescope mounted on a Skywatcher NEQ6 Pro, with an SBIG ST8300M camera and Starlight Xpress filter wheel.

Reading, Berkshire j.r.adamson@btinternet.com

A Cumbrian observatory

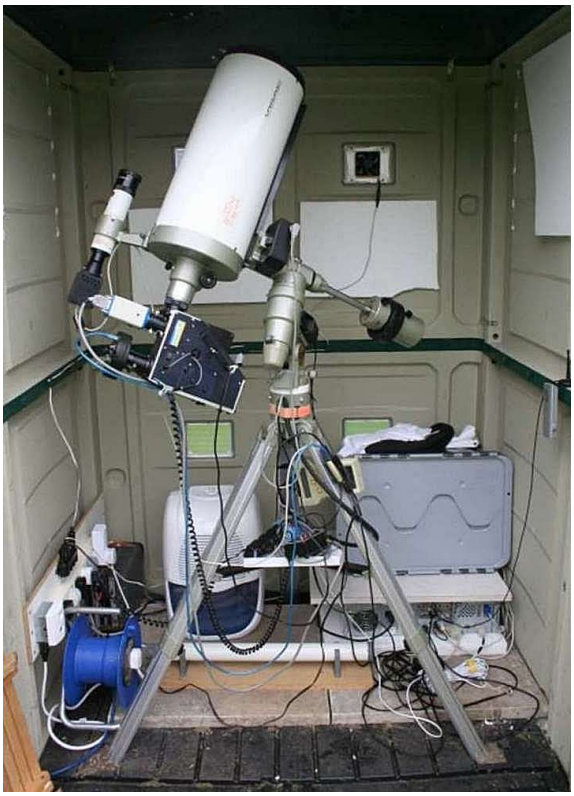
Robin Leadbeater

The observatory is based on a Keter Extend-a-Shed XL, modified so that the top hinges open. The doors are then lifted off to give the telescope full access to the sky. This can be done by one person, and in a couple of minutes the telescope is ready for use. With this design, access to the telescope is rather restricted for visual use; but this is not a problem, as observations are made utilising electronic imaging and instrumentation.

The shed was first constructed according to the manufacturer's instructions. The top panels and roof were then fixed together with metal straps, which allow the top half to be removed without the panels coming apart. Over-centre clips were fitted near the front, between the top and bottom halves, to lock the top in position when closed. The top was removed and the lugs on the bottom section which lock the two halves together were cut shorter to allow the top to clear them when swinging open. (The back lugs close to the hinge needed to be cut lower than those at the front.) The remaining part of the lugs, together with the hinge and clips, still maintain the integrity of the shed when closed. Hinges were fixed along the back edge between the top and bottom sections. (I used lift-off hinges so that the top section can be removed completely if required, though the top is rather unwieldy for one person to replace on the hinges without assistance.) Handles were fitted to the back and roof of the top section to hold onto when opening and closing the top.

To open the observatory, the doors are first opened fully. This (fortunately) gives just enough clearance for the top to swing up, clear of the doors. To clear the sides of the observatory when closed, the telescope is parked in a specific home position (stored in the 'land objects' of the Skysensor 2000 memory).

The basic construction of the observatory remains unchanged, apart from the replacement of self-tapping screws on the hinges with stainless steel nuts and bolts. The main issues have concerned condensation trapped inside after closing up for the night. (The inside of the flipt-top roof faces the cold sky when the observatory is open.) The top was lined with polystyrene (which has proved difficult to stick), and a fan was fitted to one of the small windows and a tubular heater added. Even with all this, high humidity continued to be a problem in this particularly wet corner of England. Finally, I added a small dehumidifier, which cuts in at about 70% RH and which seems to have solved the problem. (I still need the heater to aid the dehumidifier on the occasional days



when the temperature is near or below freezing. The remote sensor from a wireless weather station allows me to monitor, from the house, the conditions inside the observatory). The tripod stands on solid ground, through holes cut in the floor.

The observatory is semi-remotely operated, with a local PC controlling the mount – GPDX/Skysensor 2000 – the LHIRES III spectrograph calibration lamp, and the cameras – SC3 webcam on the finderscope, Stellacam EX on the spectrograph guide port, and ATIK ATK16-IC for the main camera. The observatory PC is part of the home wireless network, and is accessed using Windows Remote Desktop.

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http://www.threehillsobservatory.co.uk/astro/astro.htm

An observatory in Herefordshire

Chris Baddiley

My observatory building was obtained from Alexanders Observatories and cost about £3,000, though I have added other facilities, such as rubber interlocking mats on the floor for comfort and insulation and to avoid breakages, and reflective insulation panels on the inside of the roof.

The roof is motor driven and slides back halfway to expose the telescope area at one end while keeping the control room covered. All the engineering work and the wiring of the control and data systems with the two computers and mech-

anical tilt adjustment plates and adapter tilt connecting plates, and so on – everything outside the observatory wall – was installed by myself.

The observatory has an accurately aligned general camera mount on the side tripod on the outside wall, and an all-sky camera with a fish-eye lens which can provide a full-sky view every 40 seconds on one of the control computers and can be played back as a JPEG video. I also have a dark-sky monitor continuously monitoring the zenith. The Astrotrac modular strong tripod and alignment system is the latest engineering construction, redesigned over the past few years. Its predecessor is now the system on the outside observatory wall, used for general camera tracking. I also have several telescopes from earlier years, including various Intes-Micros, not in use.

Currently mounted on the two pedestals is an RCOS 12½-inch f/8 on a Paramount mount, and my preferred instrument: a Meade 14-inch f/10 on an Astrophysics AP1200. I had to set these up so that they do not come into contact with each other or the observatory walls, though this has been only partially successful. Both of them are fitted with autoguide cameras, and additional instantly attachable auxiliary piggy-back equipment includes a Lunt solar telescope, a 300-mm f/2.8 Canon lens, and various other Canon lenses and other lenses and smaller telescopes. Flip mirrors allow alignment and focusing for both general viewing and for deep-sky camera, video-camera, and diffraction-grating imaging. Most of my imaging is accomplished with the 300-mm lens, but sometimes with the Meade.

The network is installed under the lawn to the house. I have a good horizon in all directions, and a dark sky will be magnitude 20.8–21.1 per square arcsecond.

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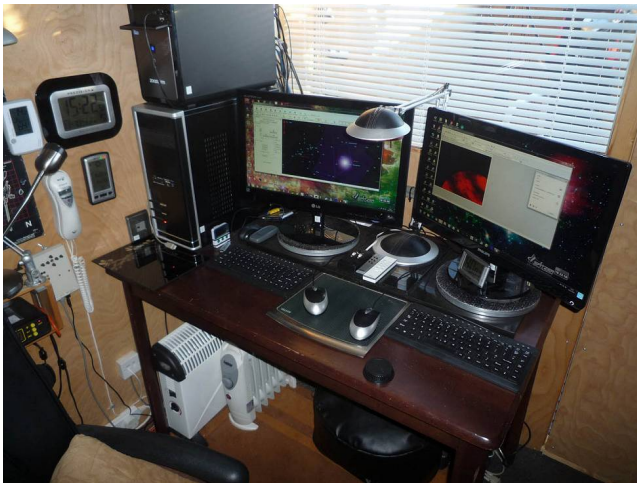

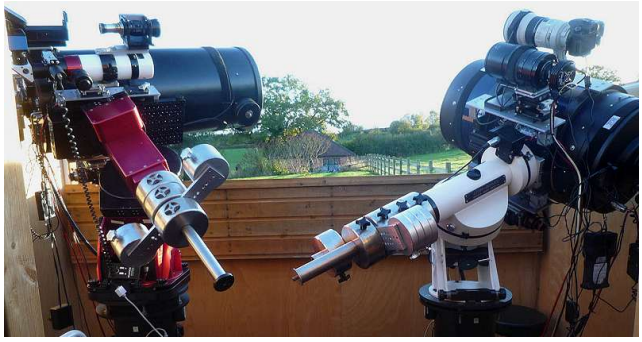

A pivoting observatory

David Spooner

My observatory, built in 2010, was designed for me by Norman Walker, with the condition that it should cover an area no larger than 7 x 7 feet, and that it should provide all-sky access, be capable of housing a 14-inch SCT, and blend with the garden as much as possible. A roll-off roof was not an option. It has a 2-inch thick fibreglass roof that pivots from the walls of the wooden enclosure, and the southern section of the enclosure folds back, giving access to the horizon. The roof is fully counterweighted and so can be rolled back by hand. Due to this design it is completely waterproof and is insulated from the heat of the Sun.

Because I was working at the time I subcontracted all the construction, so it was quite expensive. The roof cost £2,000 and the structure about £1,000, plus the additional cost of counterweights and so on. I believe that at least two copies have been manufactured by my subcontractors for astronomers in the Midlands.

The current instrument is a C11 mounted on an NEQ6. The observatory is a pleasant place for visual observations, and the telescope and cameras are controlled via a USB cable to the adjacent shed, which serves as a 'warm room'.

The observatory continues to function perfectly, and I have submitted many observations to the Comet Observation Database (COBS) and to Jonathan Shanklin, Director of the BAA Comet Section.

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A Pulsar in Cambridgeshire

Trevor Emmett

In March 2013 I installed a Pulsar 2.2-metre fibreglass observatory. I prepared the concrete pad myself (with help from my family) in only a day or two, and Gary Walker of Pulsar Observatories erected the observatory, housing a Celestron CPC1100, in less than a day.

The pad and related groundwork cost about £600 (the biggest single cost being the concrete), the dome and fittings, including the pier, cost £5,500, and since installation I have added a solar panel to trickle-charge the 12V 110AHr leisure battery that provides all the power, and fitted two additional equipment bays.

The position of the observatory is not optimal; but in all marriages there must be compromises, and I have very good views from east-north-east to south-west. I am very happy with the set-up, and my notebooks show that I am now spending approximately five times as many nights observing than previously, when I had to manhandle the CPC out of the shed. My only issue has been condensation, but now, after some time and effort, I think I have it under control.

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A hinged-roof observatory

Dove Fletcher

My observatory, built in 2006, is a hinged-roof type, inspired by a design on the Web (One-House Observatory). It is based around a good quality 8 x 6-foot garden shed (a so-called 'security' shed with small windows), and the key changes from the original design are:

1 Beams and counterweights rather than strings and pulleys with counterweights; a much simpler mechanical design.
2 EPDM sheet roof covering; much lighter and much more durable than roofing felt (supposedly about 50 years), and also much more expensive than felt.
3 A simple labyrinth seal between one roof section and the overlapping ridge-piece on the other section. This was formed by alternating weather strips on the two contiguous surfaces. This reduced the degree of overlap required and the weight of the sealing arrangement.

The basic shed cost £324, and the total cost, including additional timber, lots of hinges and other hardware, the concrete pillar, and the foundations, was about £550.

The building houses a 12-inch SCT, with associated computers linked to my home wireless network. It has never leaked nor presented any problems in operation. However, the original plywood ridge-piece on the roof did not prove sufficiently durable, and I have recently replaced it with a piece of UPVC soffit board. In the raised position the roof screens local lights, but in a suitable location it could be flat. The less than ideal colour scheme was adopted partly for domestic peace and partly for security.

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A mount without a telescope

Kevin Smith

I would like to find an instrument to fit a Charles Frank mount, which could, if necessary, be raised.

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A mechanical drive

Brian Mitchell

I would like to find a home for an old weight-driven telescope drive. It has a solid cast iron frame, brass gears, and a wire rope round the drum. It weighs about 65 lbs and requires about 70 lbs weight to run. After it was disposed of by the local club I repaired it, and for about twenty years it has sat in my dining room. It is in working order, but is, of course, not up to modern standards. I do not want any money for it, and will be pleased to give it to anyone who would care to collect it.

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